DOCUMENT RESUME

ED 205 086 HE 014 112

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TITLE The Effect of Student-Faculty Interaction on Students' Educational Outcomes. AIR Forum 1981 Paper.
PUB DATE May 81
NOTE 31p.; Paper presented at the Annual Forum of the Association for Institutional Research (21st, Minneapolis, MN, May 17-20, 1981).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Academic Achievement; College Faculty; College Freshmen; College Seniors; *College Students; Educational Benefits; Graduate Surveys; Higher Education; *Individual Development; Institutional Research; *Intellectual Development; Interpersonal Relationship; Liberal Arts; *Outcomes of Education; Professional Education; School Surveys; Student Characteristics; Student Development; Student Experience; *Student Teacher Relationship
IDENTIFIERS *AIR Forum; *University of Colorado

ABSTRACT

The effect of student-faculty interaction on student outcomes after four years was examined within the context of a causal model adapted from a general college impact model. This model includes three sets of variables: students' background characteristics, four aspects of student-faculty interaction, and four categories of outcomes. The four outcome categories were personal/social, intellectual, academic achievement, and satisfaction with education. Of the 2,830 entering fall 1975 freshmen at the University of Colorado who completed a freshman questionnaire, 480 were administered a graduating students' survey four years later. A number of items on the instruments were combined into scales that would measure one expectation variable, four student-faculty interaction variables, and nine outcome variables. Factor analysis was used. The results provided support for the importance of the impact of student-faculty interaction. Interaction that was characterized as friendly had the greater impact on these student outcomes, and the frequency of friendly student-faculty interaction had a positive effect on overall satisfaction with the college experience. The outcomes that were most affected were the intellectual outcomes, as opposed to personal/social outcomes. Liberal arts students had greater frequencies of friendly interaction with faculty than professional program students; and professional program students had greater frequencies of formal interaction with faculty than liberal arts students. A bibliography is appended. (SW)

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THE EFFECT OF STUDENT-FACULTY INTERACTION ON STUDENTS' EDUCATIONAL OUTCOMES

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IHE014112

Paper presented at the 1981 Annual Meeting of the Association for Institutional Research; Minneapolis/St. Paul, Minnesota; May 1981. The authors gratefully acknowledge the assistance of Elizabeth Anthony.

THE ASSOCIATION FOR INSTITUTIONAL RESEARCH

This paper was presented at the Twenty-First Annual Forum of the Association for Institutional Research held at the Leamington Hotel in Minneapolis, Minnesota, May 17-20, 1981. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum Papers.

Mary Corcoran
University of Minnesota
(Editor, AIR Forum Publications)

INTRODUCTION

Considerable research has been done on the impact of college on students, for example on their attitudes, values, aspirations, personality characteristics, vocational choices, and incomes after graduation. Despite this effort, only a small percentage of studies have examined the specific conditions under which students were affected in particular kinds of ways. Most of this research has been adequately reviewed by Feldman and Newcomb (1970), Lenning, Munday, Johnson, Well, and Brue (1974 a,b), Astin (1977), Bowen (1977), and Pace (1979). A portion of this research has included some investigation of the impact of increased student-faculty interaction and has generally concluded that more is better. However, only a handful of empirical studies have specifically focused on the importance of this environmental variable and its subsequent effects on student outcomes.

A more thorough investigation of the effects of student-faculty interaction is warranted for several reasons. The significance of close interaction for effective education has been widely acknowledged (cf. Sanford, 1968; Chickering, 1969; Gaff, 1973). Interest in this area also complements the growing concern for reducing the perceived effects of the impersonal environment of large universities (Feldman, 1970). Beyond the opportunity it provides for students to obtain academically-related information, increased student-faculty interaction has been shown to have a broader impact on students' general ways of thinking, methods of problem solving, and interest in various life goals. Increasing interaction is also one way in which institutions, in an era of shrinking resources and declining student demand, might increase student satisfaction with specific programs thereby helping to retain and attract highly qualified and motivated individuals. Although many institutions are making concerted efforts to increase student-faculty contact,

much of this is being done without specific knowledge of the relationships between the nature and frequency of interaction and various student outcomes.

Previous research has indicated that informal student-faculty interaction is important in influencing students' occupational decisions (Feldman and Newcomb, 1970), increasing students' educational aspirations (Thistlethwaite, 1960), encouraging students' persistence at an institution (Centra and Rock, 1971; Spady, 1971; Pascarella and Terenzini, 1977), and influencing intellectual/academic development (Wilson et al., 1975; Pascarella and Terenzini, 1978; Terenzini and Pascarella, 1980). Several studies have shown that the increased frequency of informal student-faculty interaction is related to students' satisfaction with the academic and nonacademic aspects of college (Astin, 1977; Wilson et al., 1975; Heiss, 1967; Gregg, 1972; Pascarella and Terenzini, 1976).

The most promising explanatory perspective for understanding the effects of student-faculty interaction has come from Spady (1970; 1971) and Tinto (1975) whose work is adapted from Durkheim's theory of suicide. Spady and Tinto have conceptualized the process of interaction between individuals in an institution to explain attrition. Their perspective states that the degree to which a student is integrated into the academic/social system of a college will determine the degree of persistence. Spady emphasizes social integration whereas Tinto identifies both academic and social integration as being important. Pascarella and Terenzini (1978) have taken this conceptualization and used it to explain the effects of the frequencies of student-faculty interaction for various purposes on three educational outcomes: freshman year grade point average, intellectual development during the freshman year, and personal development during the freshman year. They found that student-faculty interaction positively influences these outcomes independent

of fourteen student preenrollment demographic/academic characteristics. Terenzini and Pascarella (1980) replicated this earlier research and also examined the effects of two measures of the quality of student-faculty contacts.

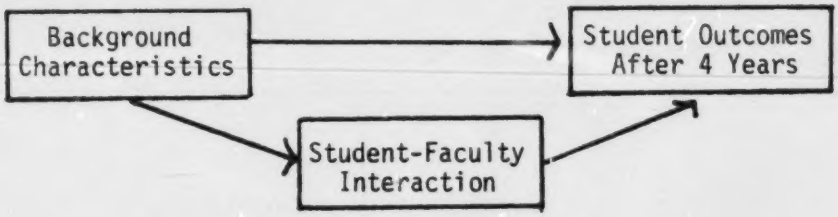
In another recent study, Lacy (1978) examined the value-related outcomes associated with two different college environments, a large liberal arts college and the small living-learning setting of a residential college within a large research university. Using a causal model, he found that the overall frequency and content of student-faculty interaction and satisfaction with faculty (as well as the nature of peer interaction) mediated some of the effects of college environments on student outcomes after one or two years.

Our study was guided by the explanatory perspective of Spady and Tinto and extends the previous work on student outcomes, including the recent research of Lacy and Pascarella and Terenzini. However, this study differed from previous work in the following ways:

1. This study examined the impact of student-faculty interaction on student outcomes after four years at one institution. Most previous work (e.g. Lacy and Pascarella and Terenzini) examined the effects of student-faculty interaction after only one or two years.
2. This study included a broad range of student outcome variables. In all, four categories of outcomes were examined. These will be discussed below.
3. Previous studies have focused on the overall frequency of student-faculty interaction or on the frequencies of interaction for specific purposes. This study examined two general social dimensions of frequency as well as two qualitative aspects of interaction. These will also be discussed further below.

This study examined the effect of student-faculty interaction on student outcomes after four years within the context of a causal model which was adapted from a general college impact model presented by Astin (1970). This model included three sets of variables: 1) students' background characteristics, 2) four aspects of student-faculty interaction, and 3) four categories of outcomes. Following Astin's impact model, these sets of variables were expected to be related in the following manner:

Figure 1



The student outcome variables were initially derived from an extensive review of the literature on goals for attending college (considered to be important by students, faculty, and administrators) and from items in the Higher Education Evaluation KIT of the Center for the Study of Evaluation, University of California at Los Angeles (Pace, 1974). A final set of outcomes was selected on the following basis. From earlier work (Endo, 1976) we knew that students reported the following outcomes to be among the most important: 1) to develop general career-related skills (skills in math, public speaking, writing, and research methods), 2) to develop independence, 3) to develop general knowledge, 4) to develop social self-confidence, and 5) to develop skills in solving problems. We supplemented this list with student-related outcomes for attending college that were considered important by faculty and other educators (Micek and Arney, 1974). These included: 1) to develop critical thinking skills, 2) to develop an interest in self-

directed learning, 3) to train students for graduate education, 4) to develop intellectual interests, 5) to achieve academically (grades), 6) to develop cultural interests, 7) to participate in extracurricular activities, and 8) to have good social experiences at the institution.

We considered "importance of an outcome" to be a value developed as a result of attending college, whereas "progress toward an outcome" was the self-reported perception of how much students gained from attending an institution. In a few cases, we wanted to measure value rather than progress. In this study, we eliminated outcomes that were duplicative in that they were found to be highly correlated with other outcomes. For example, we eliminated development of critical thinking skills since it was found to be highly correlated with development of problem solving skills. Two career-related skills outcomes, writing and research methods, were eliminated because they were found to be highly correlated with the development of public speaking and math skills respectively. We grouped our outcomes into the four categories listed below:

- PERSONAL/SOCIAL OUTCOMES
  - Importance of self-directed learning
  - Importance of developing independence
  - Social self-confidence
  - Formal involvement in extracurricular activities
  - Good social experiences
- INTELLECTUAL OUTCOMES
  - Adequacy of general knowledge
  - Adequacy of math skills
  - Development of problem solving skills
  - Development of public speaking skills

Progress toward intellectual goals

Participation in cultural activities

Highest degree planned

- o ACADEMIC ACHIEVEMENT
- o SATISFACTION WITH EDUCATION

The students' background characteristics in the model included five demographic/academic variables, six expectation variables, and the initial value for each specific outcome measured (where an initial value was feasible). Our demographic/academic variables were sex, socioeconomic status. program type, academic ability, and religiousness. These variables were included because they have been found to have an impact on outcomes, for example, on intellectual and personal/social outcomes (Feldman and Newcomb, 1970; Astin and Panos, 1968; Spady, 1970; Tinto, 1975). All of these variables were relatively common in previous outcomes research except for "religiousness." However, Astin (1977) reported that "religiousness" was related to student-faculty interaction.

Our expectation variables included degree aspiration, expectations for making friends (sociability), expectations for finding friendly faculty, expectations for exciting classes, expectations for participating in extracurricular activities, and openness to change. Students' expectations when they entered college were included because they have been found to affect outcomes. For example, Lacy (1978) and Feldman and Newcomb (1970) found that "openness to change" affected student outcomes. Also expectations can influence the nature and frequency of interaction with faculty members (Pascarella and Terenzini, 1978; Wilson et al., 1975).

Other possible background variables, such as interpersonal self-confidence and cultural interest (Astin, 1977), were not included as they were found to be highly correlated with the variables previously selected. Finally,

the initial values on specific student outcomes[1] were included in order to control for initial position while examining the impact of student-faculty interaction on those outcomes (Astin, 1970; Feldman and Newcomb, 1970).

The primary purpose of this study was to examine what types of student-faculty interaction had impacts on what types of student outcomes. We felt that in order to better investigate students' integration with faculty, it was necessary to go beyond measures which only enumerated the number of times students sought contact with faculty members on various topics (Cohen, Kamieniecki and McGlen, 1980). We conceptualized the frequency of student-faculty interaction as being of two types: "formal" interaction and "friendly" interaction. The friendly type describes interaction where faculty members have a meaningful relationship with students and exhibit a more personal and broad concern with students' emotional and cognitive growth. The friendly type also incorporates the characteristics of Snow's (1973) "high contact faculty." High contact faculty have an interactionist approach to students; they discuss a broader range of issues--issues related to students' growth--and also spend more time on class material compared to low contact faculty members. Formal interaction describes a perfunctory or professional approach with students. Discussions are limited to traditional academic and vocational advising topics. In our study, we examined the effects of the frequency of both friendly and formal interaction.

Only a few earlier studies included variables dealing with the quality of student-faculty interaction. Lacy (1978) measured overall satisfaction with faculty, while Terenzini and Pascarella (1980) measured the influence of faculty relations and faculty concern for student development and teaching. We decided to examine two slightly more specific qualitative aspects of student-faculty interaction that might have programatic implications, the

quality of faculty academic and vocational advising and the helpfulness of faculty (which also provides some indication of the degree of faculty concern and willingness to interact with students).

We expected to find the following relationships between student-faculty interaction and outcomes--and these expectations formed the main hypotheses of our research. In general, we expected to find that student-faculty interaction affected personal/social outcomes, intellectual outcomes, academic achievement, and satisfaction with education. More specifically, we expected to find that:

1. The frequency of friendly student-faculty interaction would have more overall effects than formal student-faculty interaction on the personal/social outcomes, intellectual outcomes, academic achievement, and satisfaction with education.
2. The frequency of friendly student-faculty interaction would have more overall effects on the personal/social outcomes and satisfaction with education than on the intellectual outcomes or academic achievement.
3. The helpfulness of faculty and quality of faculty advising would have more of an effect on satisfaction with education than the frequency of formal and friendly student-faculty interaction.

The relationships in the first hypothesis were expected to occur because of the nature of friendly versus formal student-faculty interaction. Frequency of friendly student-faculty interaction describes student contacts with faculty where there is a concern for wide aspects of the students' development including personal/social and intellectual growth, academic achievement, and satisfaction with education. Frequency of formal interaction

describes student contacts with faculty members where there is a more limited concern for specific intellectual or academic topics.

The second hypothesis relates the frequency of friendly student-faculty interaction with personal/social outcomes and satisfaction with education. Because friendly student-faculty interaction encompasses a wide variety of topics and concerns and because of its relatively greater attention to nonacademic areas, it was felt that personal/social outcomes would be effected more than academic achievement or intellectual outcomes. Also, Gregg (1972) and Astin (1977) found that students who experienced high collegiality (i.e. friendly interaction) with faculty members were very satisfied with their education.

The third hypothesis relates the helpfulness of faculty and quality of faculty advising to students' satisfaction with education. Even though previous research has associated frequency of student-faculty interaction with satisfaction with education, we felt that qualitative variables might be more important than frequency (quality is often regarded as more important that quantity)--especially in relation to a very general outcomes variable such as satisfaction with education. Also, Terenzini and Pascarella (1980) did find that their two qualitative measures of student-faculty interaction had greater effects on two respective general freshman year outcomes than their measures of the frequencies of student-faculty contact.

STUDY DESIGN

This study was a product of the Student Outcomes Model at the University of Colorado which was developed in 1975 to examine the impact of institutional programs on student outcomes (Endo and Lenning, 1978). The Model provides a structure for the systematic collection of student data through the use of surveys. The information gained through these surveys is used for needs assessment, program development, resource allocation, and evaluation. These surveys include variables related to students background, attitudes, values, goals, abilities, and the extent of change in these variables. The Model consists of five basic questionnaires: 1) Freshman Questionnaire, 2) Educational Experience Survey, 3) Exiting Students Survey, 4) Graduating Students Survey, and 5) Alumni Survey. The Model allows for longitudinal and cross-sectional analysis. A complete cycle of surveys is administered every six years.

This particular study used items that appeared on the 1975 Freshman Questionnaire and the 1979 Graduating Students Survey. Seventy-five percent (n=2,830) of the entering fall 1975 freshmen at the University completed a Freshman Questionnaire which provided information on their family background, present and future plans, college expectations, personal and social orientation, self-evaluations of ability in particular skills, importance of goals for attending college, educational orientation, and extracurricular activities. In addition, demographic and academic data from institutional records on each student were combined with their survey responses.

Four years later in the spring 1979 term, a Graduating Students Survey was sent to a sample of 480 seniors who were scheduled to graduate in May. The Graduating Students Survey contained many of the same items as those in the Freshman Questionnaire. Sixty-five percent of the sampled seniors

(n=311) completed the Graduating Students Survey. The survey respondents were representative of the total cohort in terms of sex, ethnicity, field of study, and academic ability. There was a higher percentage of residents among the respondents (62%) than among the total cohort (54%).

DATA ANALYSIS

A number of items which appeared on the Freshman Questionnaire or the Graduating Students Survey were conceptually designed to be combined into scales which would measure one expectation variable, four student-faculty interaction variables, and nine outcome variables. These items were factor-analyzed to determine if they would cluster according to their conceptually appropriate dimensions. Initial factors were extracted using a least squares approach (principal axis factoring with iterations), and factors with eigenvalues greater than 1.0 were rotated according to a varimax criterion. Items were used only if they had rotated loadings of at least .40.[2] This method of constructing scales used only characteristic items rather than all items irrespective of the size of their factor loadings (Kim and Mueller, 1978: 70-72). Internal consistency reliability (or alpha) coefficients were computed for each of the factor scales.

Figure 2 about here

Figure 2 shows the items that made up nine scales which were used to measure nine of the outcome variables in this study;[3] four remaining outcome variables were measured by individual questionnaire items and academic achievement was measured by students' final grade point average. Figure 2

also shows the items that made up four scales which were used to measure the four student-faculty interaction variables,[4] and the items that made up the one scale used to measure one of the expectation items[5] (the other five were measured by individual questionnaire items). Of the remaining background variables, academic ability was measured by a two-item index consisting of a respondents' first semester grade point average at the University and their composite score on the American College Tests (ACT); socioeconomic status was measured by a three-item index consisting of father's education, father's occupation, and family income; program type[6] (1=professional, 2=liberal arts) and sex (1=male, 2=female) were treated as dichotomous variables; and religiousness was measured by a two-item index consisting of questions dealing with the importance of religious beliefs and participation in religious activities.

The effects of background characteristics and student-faculty interaction variables on each outcome were examined within the framework of the causal model presented earlier (Figure 1). Since there was no clear theoretical or logical basis for specifying distinct causal sequences among the four student-faculty interaction variables, these were placed in similar intermediate positions in the model. General least squares regression techniques applicable to linear recursive models were used to quantify the effects of the background and student-faculty interaction variables (Heise, 1975; Duncan, 1975).[7]

Table 1 about here

RESULTS

To simplify the interpretation of all results, one variable was considered as having an effect on another only if the standardized regression (beta) coefficient was at least twice its standard error. Table 1 contains the

primary results of the data analysis and shows the direct effects of background variables and student-faculty interaction variables on specific outcome variables.[8]

Before discussing Table 1, it should be noted that we did compute the direct effects of background variables on each of the four student-faculty interaction variables for each outcome variable.[9] When we examined these results, program type was usually found to affect frequency of formal interaction (beta values ranged from -.10 to -.12), frequency of friendly interaction (.10 to .12), and quality of faculty advising (-.07 to -.10). Professional program students had greater frequencies of formal and lesser frequencies of friendly student-faculty interaction than liberal arts students. In addition, degree aspiration (.10 to .12), religiousness (.10 to .12) and expectations for formal involvement in extracurricular activities (.08 to .10) usually affected students' perceptions of the quality of advising. No background variable affected the helpfulness of faculty variable.

When we examined the effects of the background variables on the four categories of outcomes (Table 1), academic ability, sex, program type, degree aspiration, and expectations for making friends were found to affect several of the intellectual and personal/social outcomes. Sex, academic ability, degree aspirations, religiousness, and expectations for making friends affected satisfaction with education. Sex and academic ability affected academic achievement. Surprisingly, socioeconomic status did not affect any of the fourteen specific outcomes. In most cases, the initial value on a particular outcome (if available) had the greatest effect on the final (senior year) value of the same outcome.

The three hypotheses of this study were concerned with the effects of the four student-faculty interaction variables on student outcomes (Table 1). We found that our overall expectation was confirmed--that student-faculty interaction generally affected student outcomes even after controlling for background variables. More specifically, the frequency of friendly interaction was found to affect two of the five personal/social outcomes, six out of seven intellectual outcomes, and satisfaction with education. Perhaps surprisingly, neither frequency of friendly student-faculty interaction nor frequency of formal student-faculty interaction was found to affect academic achievement, although the latter came close. Since Pascarella and Terenzini (1978) found that course and career-related student-faculty interaction affected achievement at the end of the freshman year, our latter finding might have partly reflected the decreased variability in grade averages by the end of the senior year which makes the possible effect of formal student-faculty interaction harder to detect. In all, frequency of friendly student-faculty interaction affected nine out of the fourteen outcomes, whereas frequency of formal student-faculty interaction affected only two out of the fourteen outcomes--formal involvement in extracurricular activities and satisfaction with education (negatively). These results generally supported the first hypothesis (except for academic achievement)--that frequency of friendly interaction would have more overall effects than frequency of formal student-faculty interaction on the four categories of outcomes.

With regard to the second hypothesis, frequency of friendly student-faculty interaction affected satisfaction with education but only two out of the five personal/social outcomes. And while frequency of friendly student-faculty interaction did not affect academic achievement, as expected, it did affect most of the intellectual outcomes. Thus, our second hypothesis was only partly confirmed.

Helpfulness of faculty greatly affected satisfaction with education; it also affected progress toward intellectual goals and participation in cultural activities. However, quality of faculty advising did not affect satisfaction with education; it affected only one outcome, social self-confidence. Also, both frequency of friendly student-faculty interaction and frequency of formal student-faculty interaction affected satisfaction with education (the latter had a negative effect--this will be discussed below). Our results did not confirm the third hypothesis which stated that helpfulness of faculty and quality of faculty advising would have more of an effect on satisfaction with education than frequency of friendly or frequency of formal student-faculty interaction.

Another approach to a review of our results is to examine the joint effects of background and interaction variables on specific outcomes. We will examine one example of an intellectual outcome, one personal/social outcome, and satisfaction with education.

No variables other than the initial value (.45) and frequency of friendly interaction (.16) affected the development of problem solving skills (an intellectual outcome). There were some very small indirect effects primarily between program type and development of problem solving skills through frequency of friendly interaction.[10] This outcome concerns the discovery of new problems to analyze, trying to find the best solutions to problems, and seeking knowledge for its own sake. Previous studies have indicated that faculty tend to be more responsive to students who have similar orientations and values as themselves. Therefore, when students exhibit an interest in developing problem solving skills, faculty probably tend to encourage additional interaction which, in turn, affects the development of these skills.

Despite controlling for background variables, our analysis showed that the frequency of friendly interaction affected the development of problem solving skills.

Program type (-.22) degree aspiration (.14), initial value (.16) and frequency of formal interaction (.18) affected formal involvement in formal extracurricular activities (a personal/social outcome). There were some very small indirect effects primarily between program type and involvement in extracurricular activities through frequency of formal interaction. Program type had the greatest affect on formal involvement in extracurricular activities. The initial value did not affect this outcome as much as initial values affected other outcomes, perhaps because involvement in extracurricular activities received different emphases in high school than in college. The frequency of formal student-faculty interaction affected formal involvement in extracurricular activities, and it appears that such participation may be influenced by college advising programs.

Expectations for making friends (.15), degree aspiration (.12), religiousness (.11), sex (-.11), academic ability (.10), helpfulness of faculty (.32), frequency of friendly interaction (.19), and frequency of formal student-faculty interaction (-.11) affected satisfaction with education. There were some very small indirect effects primarily between program type and satisfaction with education through frequency of formal and frequency of friendly interaction. It is interesting to note that frequency of formal student-faculty interaction negatively affected satisfaction with education. This finding might be explained by the fact that frequency of friendly interaction positively affected satisfaction with education. In other words, the greater the friendly interaction, the less likely the interaction will continue on a formal level, and if it does, satisfaction will decrease. Our findings might also be explained by the fact that many students who are

dissatisfied with aspects of their academic work are likely to engage in interaction with faculty--primarily of the formal type.

In conclusion, our results provided support for the importance of the impact of student-faculty interaction on the intellectual and personal/social outcomes of college students. More specifically, this study distinguished between the frequency of formal and the frequency of friendly student-faculty interaction. Interaction which was characterized as "friendly" had the greater impact on these student outcomes. In addition, frequency of friendly student-faculty interaction had a positive effect on overall satisfaction with the college experience.[11]

It should be noted that while frequency of friendly student-faculty interaction had a greater impact on student outcomes than frequency of formal student-faculty interaction, the outcomes affected most were those categorized as intellectual outcomes as opposed to personal/social outcomes. It would appear that, at least at a large state university, faculty impact only goes so far. Personal/social outcomes have been shown in previous studies (e.g. Lacy, 1978) to be affected more by student peers than by faculty, and our results offer some support for that conclusion. Faculty may be strong models for intellectual growth, but peers appear to be the primary models for personal/social growth.

Finally, we did find some consistent effects related to the variable of program type. Liberal arts students had greater frequencies of friendly interaction with faculty than professional program students; and professional program students had greater frequencies of formal interaction with faculty than liberal arts students.

DISCUSSION

This study has implications for faculty, students, and administrators. Faculty need to be reminded how important they are in the overall impact of college on student outcomes. They can make a difference. In taking this fact seriously, faculty must also realize that mere frequency of interaction with students is not enough. Interaction must also be characterized by a certain quality. Students respond to friendly interaction more than just formal advising. That is to say, friendly contacts which operate at a more personal level and cover a broad range of issues have a greater impact than contacts which are rather perfunctory and limited to specific academic and vocational topics or requirements. Faculty need to be more helpful and accessible to students. Many faculty are tempted to forsake friendly interaction under the pressures of research or other time constraints. Many peer advising programs have been developed in colleges and universities in the past few years and these must guard against allowing such advising to take the place of friendly faculty interaction. Peer advising can supplement faculty interaction but should never replace it.

Students should be more persistent in seeking opportunities to be involved with faculty members outside the classroom. They should take advantage of natural events such as registration advising or faculty office hours to develop friendly relationships with faculty. They should also avoid generalizing one bad faculty interaction experience to all future experiences. Finally, students must not limit their efforts in getting to know faculty members to their own disciplines (major fields) but should be open to interaction with responsive faculty wherever they might be found.

Administrators must begin to see the value of those structural situations on their campus which foster student-faculty interaction. Residential

colleges in living units on the campus have been shown to provide an environment which enhances student-faculty interaction. The use of faculty in recruitment by the admissions staff can also be used to establish initial student (albeit prospective student) interactions which can be built upon following enrollment. Finally, administrators must believe enough in the significance of student-faculty interaction that they will use the reward structure in such a way as to recognize such activity in a tangible way.

The growing body of literature on student-faculty interaction is becoming difficult to ignore. Faculty do make a difference, both positively and negatively, on student outcomes. This study should assist faculty to understand that to the extent they have interactions with students which are more personal and reflect a broad concern with students' emotional and cognitive growth, student intellectual growth can be increased. Future studies might evaluate what campus programs which are based upon student-faculty interaction produce the most positive results.

FOOTNOTES

1. The following outcomes had an initial value: importance of self-directed learning, importance of developing independence, social self-confidence, formal involvement in extracurricular activities, development of problem solving skills, development of public speaking skills, and participation in cultural activites.
2. A number of items which appeared on both the Freshman Questionnaire and the the Graduating Students Survey were conceptually designed to be combined into scales which would measure the five outcome variables that had initial values. These items were factor-analyzed separately for each survey to determine if they would cluster according to their conceptually appropriate dimensions. The results of the two factor analyses were almost identical in that both sets of items tended to cluster in the same ways. This similar patterning of relationships provided some assurance that these items measured the same attributes at two different points in time. Factor-based scales were constructed using the factors generated from the Graduating Students Survey.
3. Alpha coefficients ranged from .60 to .84. Complete factor matrices are available on request.
4. Alpha coefficients ranged from .61 to .75. Complete factor matrices are available on request.
5. Alpha coefficient was .67. Factor matrix is available on request.
6. Liberal arts students were those whose majors were in the College of Arts and Sciences while professional program students were those from the College of Business and Administration, College of Engineering, College of

Environmental Design, College of Music, School of Education, School of Journalism, and School of Pharmacy.

7. Prior to this, the demographic/academic background variables were examined for moderate or high intercorrelations. None were found. Also when demographic/academic background variables were correlated with initial outcome values, no moderate or high correlations were found.
8. In order to test for the possible presence of important statistical interactions among variables, a preliminary analysis was conducted where the four student-faculty interaction variables were crossed with the 10 demographic/academic background variables to create 40 interaction terms. These were then incorporated into the framework of the causal model as separate variables and their direct effects on specific outcomes examined. Very few interaction terms were found to have effects on specific outcomes. Detailed results are available on request.
9. A table containing the direct effects of background variables on student-faculty interaction variables is available on request.
10. Results presented in Table 1 do not show the indirect effects between background variables and outcome variables through student-faculty interaction variables.
11. Our results should be interpreted with caution given the usual assumptions that must be made for linear recursive causal modeling (e.g. linearity, uncorrelated error terms, interval level measurement, homoscedasticity, measurement reliability)(Heise, 1975). We are aware of the problems regarding unique variance in measured variables and the development of approaches to causal modeling for unobserved variables (Goldberger and Duncan, 1973; Jöreskog, 1973; Jöreskog, 1977; Jöreskog and Sorbom, 1978).

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Figure 2

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ITEMS IN FACTOR-BASED SCALES

OUTCOME VARIABLES

Importance of developing independence

- Importance of developing independence and self-reliance
- Importance of developing identity, self-worth, self-confidence

Social self-confidence

- Lack of difficulty in speaking before a group of people; ideas are communicated clearly and effectively
- Not awkward in social situations
- Not shy about making new friends

Participation in cultural activities

- Attended one or more stage plays or read a play
- Visited an art gallery or museum or completed a sketch or painting
- Read one or more contemporary novels
- Attended a concert, theatre or exhibition which featured the art, music or drama or another country, race or ethnic group

Development of problem solving skills

- Discovering new problems to think about
- Seeking the best possible answer even if it takes a long time
- Observing things and thinking about how they work or occur
- Formulating own hypotheses about doing things
- Seeking knowledge for its own sake

Adequacy of general knowledge

- Preparation in general knowledge
- Preparation in applying knowledge to new situations

Adequacy of math skills

- Preparation in statistics and research methods
- Preparation in general algebra
- Preparation in advanced math

Progress toward intellectual goals

- Progress toward acquiring abilities to raise questions, examine different views, and solve problems
- Progress toward acquiring skills for quantitative thinking
- Progress toward acquiring skills for self-directed learning
- Progress toward applying knowledge to new situations

Satisfaction with education

- Satisfaction with overall quality of education
- Satisfied with selection of courses for general education requirements
- Satisfaction with quality of program in major
- Satisfaction with variety of courses in major
- Satisfaction with challenge of courses in major
- Satisfaction with classroom equipment/facilities
- Satisfaction with overall academic experiences

Formal involvement in extracurricular activities

- Became an officer in a special interest group (student government, athletics, music, etc.)
- Volunteered in the community for a nonprofit organization (church, club, clinic, etc.)

STUDENT-FACULTY INTERACTION VARIABLES

Frequency of formal student-faculty interaction

- Number of instructors who gave academic advice
- Number of instructors who gave career advice
- Number of times faculty members advised on academic topics
- Number of times faculty members advised on vocational counseling

Frequency of friendly student-faculty interaction

- Number of instructors who discussed a wide range of topics
- Number of instructors who encouraged to continue education
- Number of instructors who gave extra help in coursework
- Number of instructors who gave academic advice

Helpfulness of faculty members

- Helpfulness of faculty members
- Accessibility of faculty members

Quality of faculty advising

- Quality of academic advising
- Quality of career advising

EXPECTATION VARIABLE

Expectation for making friends

- Expectation for making many close friends in college
- Expectation for finding many persons to date of the opposite sex
- Expectation for fitting in easily with other freshmen

Table 1

DIRECT EFFECTS OF BACKGROUND VARIABLES
AND STUDENT-FACULTY INTERACTION VARIABLES ON STUDENT OUTCOME VARIABLES
(Standardized Regression Coefficients)

BACKGROUND/INTERACTION VARIABLES	Sex[1]	Academic ability	Socio-economic status	Degree aspiration	Program type[2]	Religiousness	Expectations for friends	Expectations for friendly faculty	Expectations for exciting classes	Expectations for extracurricular activities	Openness to change	Initial value	Frequency of formal SF interaction	Frequency of friendly SF interaction	Helpfulness of faculty	Quality of faculty advising	R^2
PERSONAL/SOCIAL OUTCOMES																	
Importance of self-directed learning	.15*	.05	-.04	.12*	-.08	-.01	.07	.05	.12*	-.14*	.10*	.16*	.00	.22*	-.04	-.02	16
Importance of developing independence	.14*	.07	-.07	.13*	.06	-.12*	.11*	.03	.09	-.07	.13*	.17*	.01	.04	.04	.06	15
Social self-confidence	.06	-.23*	-.02	.05	-.03	-.05	.05	.06	.00	.05	-.02	.41*	-.03	.03	.04	.10*	27
Formal involvement in extracurricular activities	.04	-.08	-.02	.14*	-.22*	.08	.06	-.05	-.02	.08	-.06	.16*	.18*	-.03	-.06	-.06*	18
Good social experiences	.20*	-.03	.03	-.01	.04	.03	.12*	.10*	-.08	.05	-.14*	-	.00	.10*	.09	.07	14
INTELLECTUAL OUTCOMES																	
Adequacy of general knowledge	-.06	.04	-.01	.10*	.04	.00	.12*	.02	.01	.13*	.04	-	.09	.26*	.03	.03	13
Adequacy of math preparation	-.26*	.23*	.01	.09	-.15*	.04	-.12*	.08	.15*	-.04	-.06	-	.09	.18*	.03	-.01	27
Development of problem solving skills	-.09	.02	-.04	.05	.09	.04	.00	-.02	.04	-.03	.09	.45*	.00	.16*	.00	.06	29
Development of public speaking skills	-.02	.06	.05	.06	-.07	-.04	.04	-.03	-.01	.10*	-.07	.45*	.00	.16*	.01	.07	31
Progress toward intellectual goals	-.09	-.04	-.09	.06	-.04	.04	-.02	-.07	.14*	-.04	.07	-	-.03	.24*	.16*	-.02	13
Participation in cultural activities	.12*	.10*	.07	.05	.11*	.08	.13*	.10*	.00	-.06	.01	.30*	-.04	.19*	.12*	-.02	25
Highest degree planned	-.02	.22*	.02	.30*	.18*	.04	-.01	.04	.00	-.02	.06	-	.04	.04	.09	-.02	22
ACADEMIC ACHIEVEMENT	.10*	.42*[3]	.00	.02	-.02	.07	.01	-.03	.05	-.06	.00	-	.09	.00	.02	.01	20
SATISFACTION WITH EDUCATION	-.11*	.10*	-.01	.12*	-.01	.11*	.15*	.06	.07	-.07	.05	-	-.11*	.19*	.32*	.08	28

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* Coefficient is at least twice its standard error.

1. Male=1, Female=2.
2. Professional program=1, liberal arts=2
3. Academic ability measured by composite ACT score only.